Engr

THE CORNELL ENGINEER

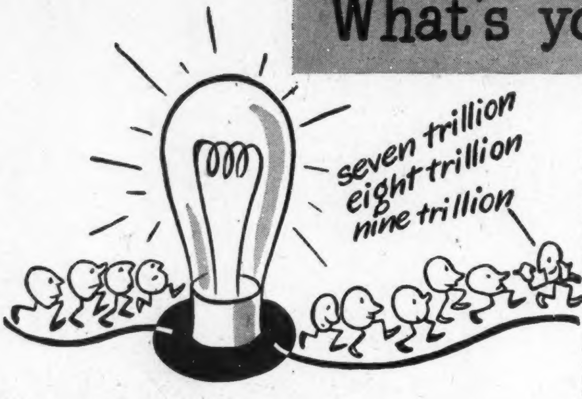
Vol. 12, No. 3

December, 1946

25 Cents
Per Copy

COLLEGE OF ENGINEERING · CORNELL UNIVERSITY

What's your S.Q.*?



1. WHAT IS THE TOTAL WEIGHT of the electrons flowing through a 100-watt lamp filament, burning continually for one year on a 115-volt circuit — (a) 150-billionth ounce, (b) 5460-millionth ounce, (c) 2⅜ ounces?

2. WHAT IS THE AMPERAGE of the average thunderbolt — (a) 20,000 amperes, (b) 1,700,000 amperes, (c) 4,000,000 amperes?

3. AIR PASSING THROUGH the experimental wind tunnel at Wright Field, during a single hour, weighs as much as — (a) Army "jeep", (b) electric locomotive, (c) medium-size ocean liner?

4. THE PUREST FORM of iron ever produced is used in — (a) arc-welding electrodes, (b) thermostatic controls, (c) spectrum analysis?

What does Westinghouse offer College Graduates?

If you have the proper qualifications, Westinghouse offers you a real opportunity for a career in research, engineering, manufacturing, design, service, sales, and business administration.

Westinghouse owns and operates 29 major plants for the manufacture of all kinds of electrical and mechanical equipment, ceramics, plastics, alloys and many other products.

If you're interested in the future of *extraordinary opportunity*, send for your copy of our new book, "Finding Your Place in Industry." Make it the *guide book* of your future!

Write: University Relations, Educational Department, Westinghouse Electric Corporation, 306 Fourth Ave., Pittsburgh 30, Pennsylvania.

ANSWERS

1 — (b) *Six million trillion electrons flow through a 100-watt filament every second at 115 volts — 17.1 x 10²⁵ electrons per year — weighing about .005 ounce.*

2 — (a) *The intensity and duration of lightning strokes are measured and recorded automatically by the "fulchronograph" — developed by Westinghouse engineers.*

3 — (c) *Every hour, about 27,000 tons of air are driven through the Wright Field wind tunnel by a 40,000 hp electric motor — designed and built by Westinghouse engineers.*

4 — (c) *Iron 99.99% pure, is essential for comparison purposes in spectrography. It is produced in the Westinghouse Research Laboratories by fusing the purest commercial iron obtainable in a high frequency induction furnace, surrounded by an atmosphere of hydrogen gas.*

*SCIENTIFIC QUOTIENT — broad knowledge in the field of science

Westinghouse
PLANTS IN 25 CITIES · OFFICES EVERYWHERE

Tune in: TED MALONE — Monday, Wednesday, Friday, 11:45 am, EST, American Network

Founded 1885

The CORNELL ENGINEER

Volume 12 Number 3

CONTENTS

Cover: A mechanical drafting class for Chemical Engineers in session in Olin Hall.

Member of The Engineering College Magazines Associated

Chairman, Wayne S. Beattie, Univ. of Colorado, Boulder, Colorado
Advertising Representative, Littell-Murray-Barnhill, Inc.
101 Park Ave., New York and 605 N. Michigan Ave., Chicago

Published monthly—October to May—by the **Cornell Engineer, Inc.**, Lincoln Hall, Ithaca, N. Y. Edited by the undergraduates of the College of Engineering, Cornell University. Entered as second class matter at the Post Office at Ithaca, N. Y., under Section 103, Act of October 3, 1917.

Subscription per year: regular $2.00; with membership in the Cornell Society of Engineers $2.00 (See President's page); student $1.50; single copy $.25.

This issue, December, 1946.

Ch
is ol
nized
relati
recor
equip
for
produ
ory
basic
ledge
sign
velop

Mo
dustr
of the
sons
Germ
devel
centu
twent
States
eratio
prior
impor
relati
suppl
abrup
sary
cal in
done
the U
tion c
every
ing—a
strong

Du
ment
from
plants
chanic

B
the
Hal

Vol.

Engr

Chemical Engineering

Engineering at Cornell (18)

By FRED HOFMANN RHODES

Director of the School of Chemical Engineering

Chemical Engineering as an art is old; as a science and a recognized branch of engineering, it is relatively young. Since the dawn of recorded history, men have built equipment and operated processes for the manufacture of chemical products, but only within the memory of men now living have the basic theory and the specific knowledge essential for intelligent design and proper operation been developed and co-ordinated.

Modern chemical engineering industry dates from about the middle of the nineteenth century. For reasons that will not be discussed here, Germany took the lead in industrial development during the nineteenth century and the early years of the twentieth century. In the United States, chemical plants were in operation since colonial times, but prior to the First World War our important chemical industries were relatively few. When, in 1914, the supply of foreign chemicals was abruptly shut off, it became necessary to develop a complete chemical industry in America. This was done so successfully that by 1919 the United States occupied a position of world supremacy in almost every field of chemical manufacturing—a position that has grown even stronger since that time.

During the years of the development of the German industries, from 1860 to 1914, the chemical plants were built and run by mechanical engineers and chemists, working in collaboration. The collaboration was not always entirely satisfactory—the plants were designed and they were operated, but the design did not always permit smooth and economical operation and the operation did not always give maximum production at minimum cost. To a considerable extent, the design remained empirical, and the great bulk of special information and theory that constitutes the modern science of chemical engineering was not available. This was also true in this country.

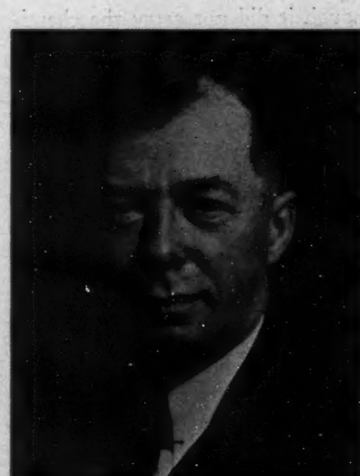
The first curriculum given under the name of "Chemical Engineering" at any American university was offered at Massachusetts Institute of Technology in 1888. This bore little resemblance to the chemical engineering curricula of today; it was essentially mechanical engineering with some additional work in chemistry. Apparently this new course wasn't received with any special enthusiasm. In 1898, the University of Michigan—the second American university to offer a specific degree in this field—announced its curriculum. During the first decade of the present century, several other schools instituted courses in chemical engineering. In 1908, the American Institute of Chemical Engineers was organized. This society, through its Committee on Chemical Engineering Education, has been very influential in

Busiest corner of the campus—the Cornell switchboard in Olin Hall.

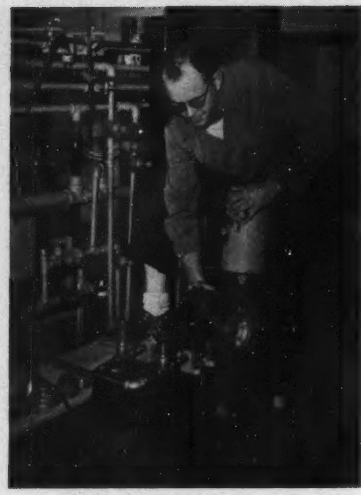
THE AUTHOR

Although a graduate of Wabash College, Director Rhodes is a Cornellian from way back. He received his Ph.D. in Chemistry at Cornell in 1914, and except for several years spent in industry shortly thereafter, he has taught here ever since. He was professor of industrial chemistry until 1933 when he became professor of chemical engineering.

Professor Rhodes has directed the School of Chemical Engineering since its founding in 1938. In 1942 he was awarded the Johnson Professorship of Industrial Chemistry. He holds numerous chemical patents, is the author of technical articles and books, and is a member of many honorary societies including Tau Beta Pi, Sigma Xi, Phi Kappa Phi, and Phi Beta Kappa.



Prof. F. H. Rhodes



Student at work in his Senior Research Lab.

promoting adequate instruction in chemical engineering in most of the universities and technical schools throughout the country.

At Cornell, no separate degree in chemistry or chemical engineering was offered before 1910. In that year there was organized, in the College of Arts and Sciences, a four-year curriculum leading to the degree of Bachelor of Chemistry. This included a very considerable amount of required work in chemistry and in physics and mathematics, and some work in mechanics, experimental engineering, and other engineering subjects. It was, in fact, similar in scope and content to many of the curricula in chemical engineering at other institutions, although it did not carry the chemical engineering label and it omitted many of the specific courses that would today be considered indispensable.

In February, 1916, fire destroyed Morse Hall, in which the Department of Chemistry was housed. While the ruins were still smoking, a staff meeting was held to formulate plans for carrying on instruction. Emergency accommodations for most of the basic courses were improvised, and a few new courses were organized to substitute for old ones that could not be given.

At that time, a very young instructor by the name of Rhodes rashly offered to give a lecture course in chemical engineering; his sole qualification for this job appears to have been that he was absolutely unbiased by any knowledge of the subject matter or experience in the field. The seriousness of the emergency is indicated by the fact that his offer was accepted; because, however, the term "chemical engineering" had certain implications that were disliked by some of the members of the staff of the Chemistry Department, the official title of the course was changed to "Industrial Chemistry."

In 1917, this instructor left the university to take a job in industry, and the work in "Industrial Chemistry" was discontinued. In 1920 this same person re-appeared on the Cornell scene as Professor of Industrial Chemistry and gave courses in "Industrial Chemistry Lectures" and "Industrial Chemistry, Laboratory." These covered the field of what is now known as Unit Operations in Chemical Engineering, although for certain reasons the term "chemical engineering" was avoided. These courses were to become "Chemical Engineering 705" and "Chemical Engineering 710" and, more recently "Chemical Engineering 5303 and 5304" and "Chemical Engineering 5353 and 5354." Later, other courses in chemical engineering were added to the list.

Five-Year Culliculum

In 1931 a five-year curriculum leading to the degree of "Bachelor of Chemical Engineering" was developed. Students in this curriculum received the degree of Bachelor of Chemistry on the satisfactory completion of the first four years of work and the degree in chemical engineering at the end of the fifth year. General supervision of the course was assigned to a committee composed of Professor Rhodes, Professors Diederichs and Davis of the School of Mechanical Engineering, and Professors Papish and Mason of the Department of Chemistry.

In 1938 the School of Chemical Engineering was organized as one of the four schools constituting the College of Engineering at Cornell. The degree of Bachelor of Chemistry was discontinued. An integrated curriculum in chemical engineering was offered, leading to the degree of Bachelor of Chemical Engineering at the end of the fifth year. For a short time during the recent war, a four-year curriculum leading to the degree of Bachelor of Science in Chemical Engineering was offered, primarily to make it possible for us to give a degree to those men in the Navy and Marine V-12 programs who had completed satisfactorily the maximum amount of work (eight terms) permitted under those programs. Civilian students were given the option of taking either the four-year or the five-year course. With almost complete unanimity, they elected the longer course. The four-year course is now discontinued; Cornell now offers only the degree of Bachelor of Chemical Engineering on the satisfactory completion of five years of work.

In 1946 a division of Metallurgical Engineering was established

(Continued on page 42)

Chemical Engineering freshmen in the modern and spacious drawing labs in Olin Hall.

Monsieur Houdry and High Octane Gasoline

By KATHARINE R. WEIDMAN, Arts '48

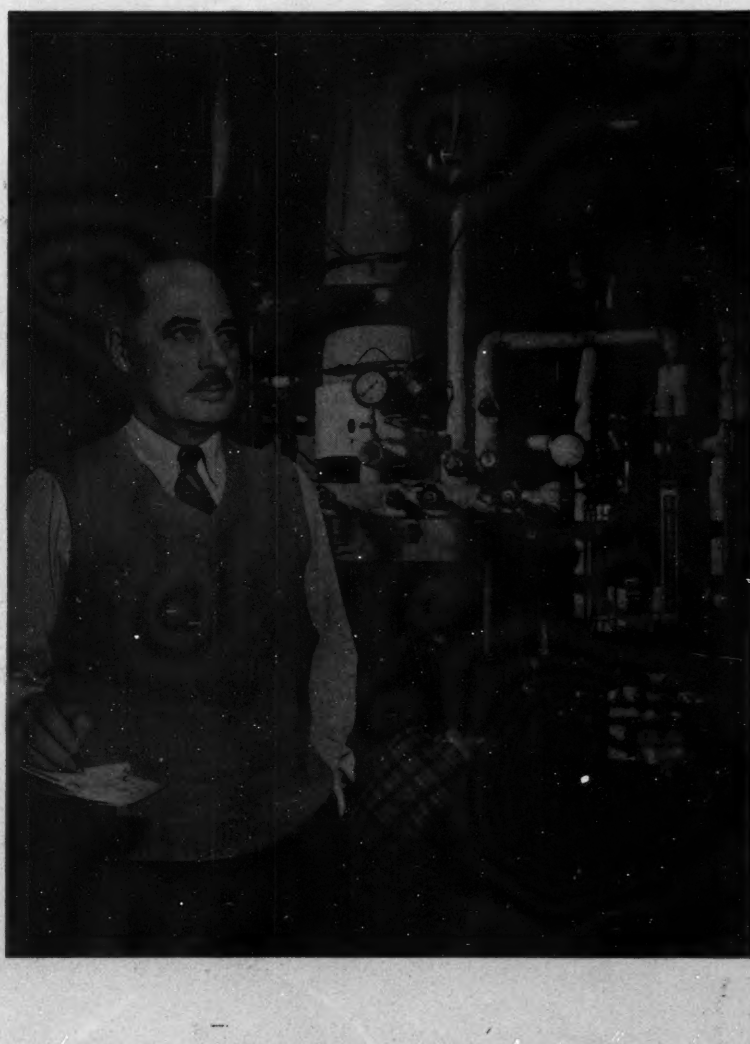
Cuts courtesy Houdry Process Corporation of Pennsylvania

Here's an authoritative account of catalytic cracking for a major industry. Thanks to Houdry Corporation and Sun Oil, all information is up-to-the-minute as we go to press.

When petroleum refining was in its infancy, and the demand for gasoline was small, fractional distillation was the only method used to extract very limited amounts of the fuel from petroleum. In 1913 it was discovered that by means of high temperatures and pressures, hydrocarbons in the heavier fractions could be cracked into the lighter molecules which are constituents of gasoline. But automobile engines didn't respond too well to either type of gasoline, and their knocking was annoying as well as costly. Thomas Midgley, a Cornell graduate, discovered just what happened when the spark plug touched off the compressed vaporized fuel: the flame traveled rapidly, but the part of the fuel furthest from the spark plug got excited under pressure and exploded spontaneously before the flame reached it, which resulted in the "ping," wasted power, and overheating. Having found the root of the trouble, he strove to correct it. A small quantity, not exceeding three cubic centimeters of tetraethyl lead, Midgley's discovery, added to a gallon of motor fuel, slows down the spread of flame. This enables the gasoline to burn evenly and greatly raises its octane number. "Octane number," used to describe the anti-knock rating of a gasoline, means the percentage of 2,2,4-trimethylpentane, or "isooctane," which, when mixed with normal heptane, a very poor fuel, produces the same knocking characteristics as the gasoline in question. The determining of the octane number is carried out under carefully controlled conditions in a specially constructed one-cylinder engine. With improved gasoline as the fuel, more powerful engines could be built, and the race was on between better engines and better gasoline.

A Frenchman, who graduated with highest scholastic honors as a mechanical engineer at the age of nineteen, was destined to revolutionize the standard, thermal cracking method of petroleum refining. Eugene Jules Houdry was for a time content to work with his father in the steel manufacturing business of Houdry & Fils. But he became interested when he heard of an apothecary, Prudhomme, who claimed to synthesize gasoline from lignite, for France had little crude oil but much "brown coal." By means of a cobalt and nickel catalyst, and apparatus scarcely larger than a kitchen table, the pharmacist produced a few drops of gasoline every hour. Houdry and his friends sponsored Prudhomme until he added gasoline to coal tar

Eugene J. Houdry, pioneer and inventor of catalytic cracking as applied to the transformation of peteroleum hydrocarbons.



from
get
Fren
ways
anim
line
coul
help
even
happ
ables
place
perm
1926
cary'
to pe
carde
ful d
the
tine
smell
recei
the
silica
gallo
car. T
to ni

In
Houd
with
in th
Corp
$3,30
(whic
Co.,
third
his s
the r
becan
fining
share
Corp.
the S
Hook
millio
earlie
ment
cess s
profit
proble
shape
solved
gineer
was a
rangin
the ch
reacto
off the

One
catalyti
Sun O
finery.

from which he later attempted to get the precious fuel. Of him the Frenchman says, "Prudhomme always thought of catalysts as little animals. By putting a little gasoline in with them, he thought he could give them the right idea—help them along." Little is known even at the present time about what happens to a catalyst when it enables a chemical reaction to take place smoothly without itself being permanently changed. As early as 1926 Houdry thought the apothecary's principles could be applied to petroleum, and he tried and discarded many catalysts. One eventful day in April, 1927, at three in the morning when making a routine check, he found a clear, good-smelling gasoline dripping into one receiver. Hurriedly he ran more of the crude through the aluminum silicate catalyst and tried several gallons of his new fuel in his racing car. The speedometer easily climbed to ninety miles an hour.

In 1930, invited by Vacuum Oil, Houdry sailed for the United States with his apparatus carefully crated in the hold. The Houdry Process Corporation, with a capital of $3,300,000 was formed; Vacuum (which became Socony-Vacuum Oil Co., Inc. in 1932) held roughly one-third of the shares and Houdry and his six hundred French associates the rest. Arthur Pew, of Sun Oil, became interested in the new refining procedure, and Sun joined as shareholders in the Houdry Process Corp. In 1933 Houdry moved into the Sun Laboratories at Marcus Hook, Pennsylvania. More than two million dollars were added to the earlier effort to further development of the catalytic cracking process so that it could be put on a profitable commercial scale. Many problems such as the best size and shape of the catalyst had to be solved by Houdry chemists and engineers. The regeneration of catalyst was a principle handicap. By arranging reactors in units of three, the charge could flow through one reactor, while a blast of air burned off the carbon accumulation in the other two, then the flow switched automatically. In April, 1936, the first catalytic cracking plant at Socony-Vacuum Oil Co.'s Paulsboro, N. J., refinery went into operation, charging 2,000 barrels of stock. In March, 1937, Sun's 15,000 barrel catalytic cracker began operation charging the murky residuum that remained after the distillation process had extracted all the gasoline and heating oils it could from it. Out of this charge, the magic pellets made forty-eight per cent of eighty-one octane gasoline. Other Houdry plants were built by Socony-Vacuum and Sun Oil. In 1939 the Houdry Process Corp. was ready to sell licenses to other refiners.

This new, remarkable process was an answer to many of the headaches and realization of some of the fondest dreams of the refiner. Under the high pressures and temperatures of thermal cracking, from two hundred to three thousand pounds per square inch and from twelve hundred to eight hundred sixty degrees F., a certain proportion of the charging stock, instead of splitting into smaller molecules, tends to recombine forming asphalt, fuel oil, and other less profitable products. In the Houdry process, with a temperature of from seven hundred fifty to nine hundred degrees and pressure under a hundred pounds, the proportion of by-products is much smaller. In 1937 an overall gasoline recovery of forty-four per cent of the total crude oil was the ultimate industry could do, and the twenty-eight percent fuel oil and asphalt, also part of the returns, were little profitable. Six years later, by using conventional methods, ordinary petroleum yielded gasoline with an octane rating of about sixty; by adding costly tetraethyl lead, the rating could be boosted to seventy or seventy-two for "regular" gasoline and to seventy-eight to eighty for "premium" grades. From even the poorest types of crudes and refinery residuum Houdry could produce gasoline with an octane rating of "premium" fuel, and this without adding tetraethyl lead.

In a refinery operating on the Houdry principle, the crude oil from the fields is first sent through a fractional distillation operation to remove the gasoline, kerosene, and light oils naturally present. Gas oil, the fraction next in heaviness to distillate fuel oils, is the charging stock in the catalytic cracking unit. After being heated to roughly nine hundred degrees, the charge is pumped to a vaporizer, then to a tar separator where the unvaporized heavy material is separated from the vapors. Now the vapors enter the catalytic cracking case, the heart of the process, and are pumped

(Continued on page 28)

Cycle time control board in a modern Houdry fixed-bed unit.

One of several Houdry fixed-bed catalytic cracking units installed at Sun Oil Co.'s Marcus Hook refinery.

Heat-Power Engineering at Cornell

By B. J. CONTA and C. O. MACKEY

Professors of Heat-Power Engineering

It has long been felt by students and faculty alike that the relationship between the teaching of heat-power engineering in the classroom and the conducting of laboratory experiments in this field has not been an ideal one in the Sibley School of Mechanical Engineering. The classroom work in this important field has been taught in the Department of Heat-Power Engineering. Until recently, all laboratory work in mechanical engineering was taught in the Department of Experimental Mechanical Engineering. The reorganization of this single department into the Department of Engineering Materials and Mechanical Engineering Laboratory, as described in a recent issue of the *Cornell Engineer* (Vol. 11, No. 1), has pointed the way towards an improved correlation between classroom and laboratory work in heat-power engineering. This division of laboratory equipment and staffs has resulted in the mechanical laboratory becoming in effect, if not in name, a heat-power engineering laboratory. This suggested the possibility of combining the staffs of the present Heat-Power Department and the Mechanical Engineering Laboratory into a single department of Heat-Power Engineering thus removing the somewhat arbitrary horizontal division between classroom and laboratory teaching in this field. Last June, by action of the Sibley faculty, Director Barnard appointed a committee to study the possibility of this combination. This committee consisted of Professors Conta, Ellenwood, Fairchild, and Mackey with the director as chairman, ex-officio. Director Barnard's place on the committee was filled by Director W. J. King when he assumed his new duties in July. The report of this committee is now under consideration by the school faculty. The chief purpose of this article is to describe briefly the findings and recommendations of this committee.

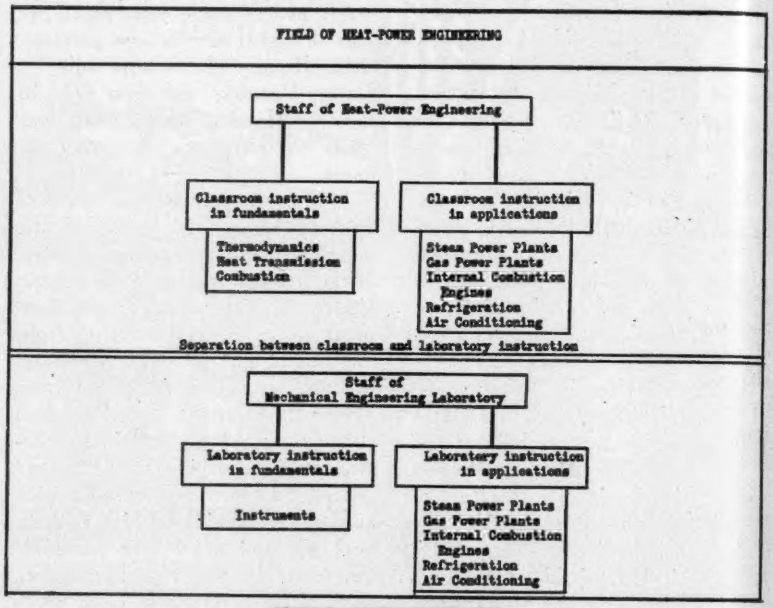


FIGURE I. PRESENT ORGANIZATION

The basis of the plan for combining these two departments is the definition of what constitutes heat-power engineering. The plan is based upon the belief that the fundamental classroom subjects are thermodynamics, heat transmission, and combustion. The fundamental laboratory subjects are instruments and apparatus for measurement and control; more specifically for the measurement and control of such properties as pressure, temperature,

AUTHOR

Professor Bartholemew J. Conta is a native of Rochester, N. Y. and received a B.S. in M.E. at the University of Rochester in 1936. He was awarded an M.S. in Engineering at Cornell the following year.

Before coming to Cornell, Professor Conta did research and consulting for several industrial firms including the Texas Company and the Ritter Company. He holds a Professional Engineer's License for New York State. Honorary societies of which he is a member include Phi Beta Kappa, Phi Kappa Phi, and Atmos.

Prof. B. J. Conta

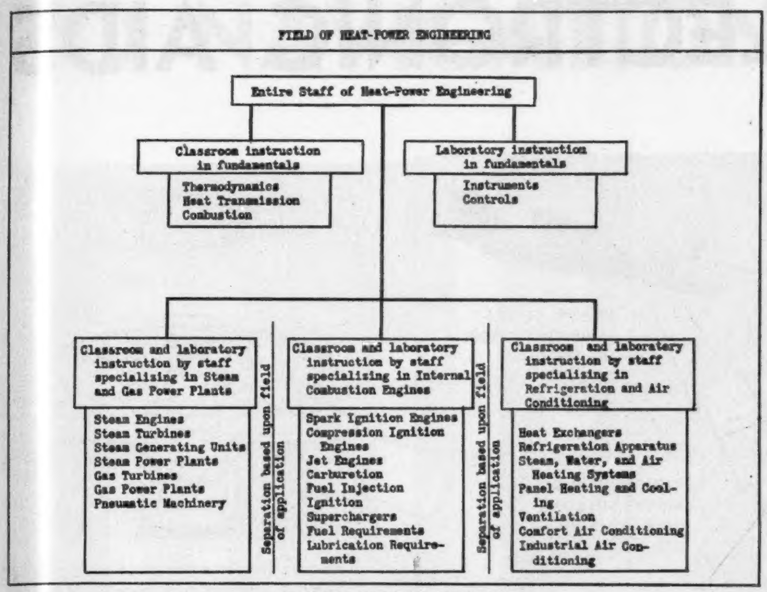


FIGURE II. PROPOSED ORGANIZATION

velocity, and liquid level of fluids, and the speed, torque, and power of reciprocating and rotating machinery. These fundamental subjects have three fairly well defined, though overlapping, fields of application: steam and gas power plants, internal combustion engines, and air-conditioning and refrigeration.

With the subject matter thus defined, it is quite evident that although a thorough knowledge of the fundamentals is a necessary basis for a complete understanding of any of the fields of application, specialization in the application of these fundamentals is quite permissible, and is probably desirable. Indeed, it is just this point which gives the plan outlined in the committee report its chief advantage over the present departmental system. At present, the classroom phases of all three of these fields of application are taught by members of the Heat-Power Department while laboratory phases of all three are taught by the staff of the Mechanical Engineering Laboratory. A man who becomes head of one of these departments and who has specialized in one of the three fields of application, must obviously have direct responsibility over subject matter and equipment outside the sphere of his chief interest. A member of either of these departments, if he wishes to avoid the monotony of teaching only a few different subjects, must teach outside the field of application in which he has specialized.

From the students' viewpoint, also, the present organization has definite disadvantages. Within a given subject, such as internal combustion engines for example, the laboratory work is given by a teacher in one department and the classroom work in another department by a man usually of the same rank so that neither is in charge of the work of the other. The two phases of the subject are very apt to be taught in a somewhat independent manner, and the correlation both in time and in course content is apt to be poor unless unusual pains are taken to avoid it.

These difficulties are overcome in the proposed plan by combining the staffs of the two departments and expecting all members to be well founded in all of the fundamentals of heat-power engineering, but permitting, or even requiring, specialization in one of the three major vertical divisions which constitute the fields of application. In this selected area of specialization, each staff member would be permitted and encouraged to teach both laboratory and classroom work. From the students point of view, better integrated instruction would result from the fact that all staff members would be basing courses on the same fundamentals, and the courses in the fields of application would be carefully correlated ones with the same men teaching both classroom and laboratory phases of the same subject. From the point of view of the staff, opportunities for their professional development would be improved by the specialization this plan would permit. Instead of being responsible for instruction on any topic in the large field of heat-power engineering, each member of the staff in the new plan will have his principal responsibility limited to a relatively small division in that field. In this way, each staff member will be encouraged to become something of an expert in a limited area of his own choice.

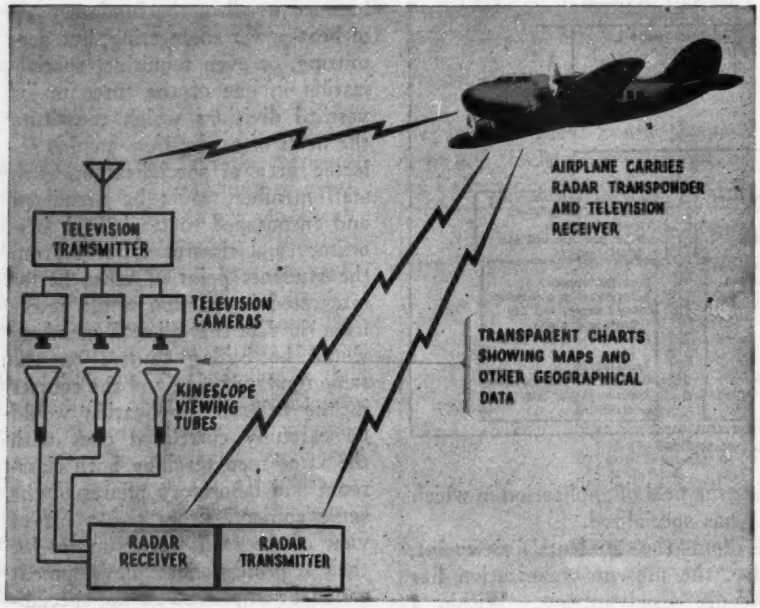
(*Continued on page* 34)

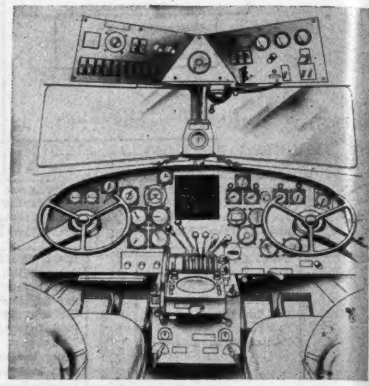
AUTHOR

Prof. C. O. Mackey

Charles O. Mackey, professor of heat power engineering, has been director of the Mechanical Engineering Laboratory since 1942. He has been a member of the staff of the college since 1924 and received his M.E. degree here in 1925. Generally recognized as an expert on air conditioning, he has been a consultant for the Carrier Corporation and has written numerous articles. He has collaborated with Willis Carrier and with Professors Barnard and Ellenwood on books concerning air conditioning and heat power engineering. Professor Mackey holds membership in Sigma Xi, Tau Beta Pi. and Phi Kappa Phi.

ELECTRONIC AIDS





Above: Suggested method of mounting Teleran kinescope in cockpit of plane.

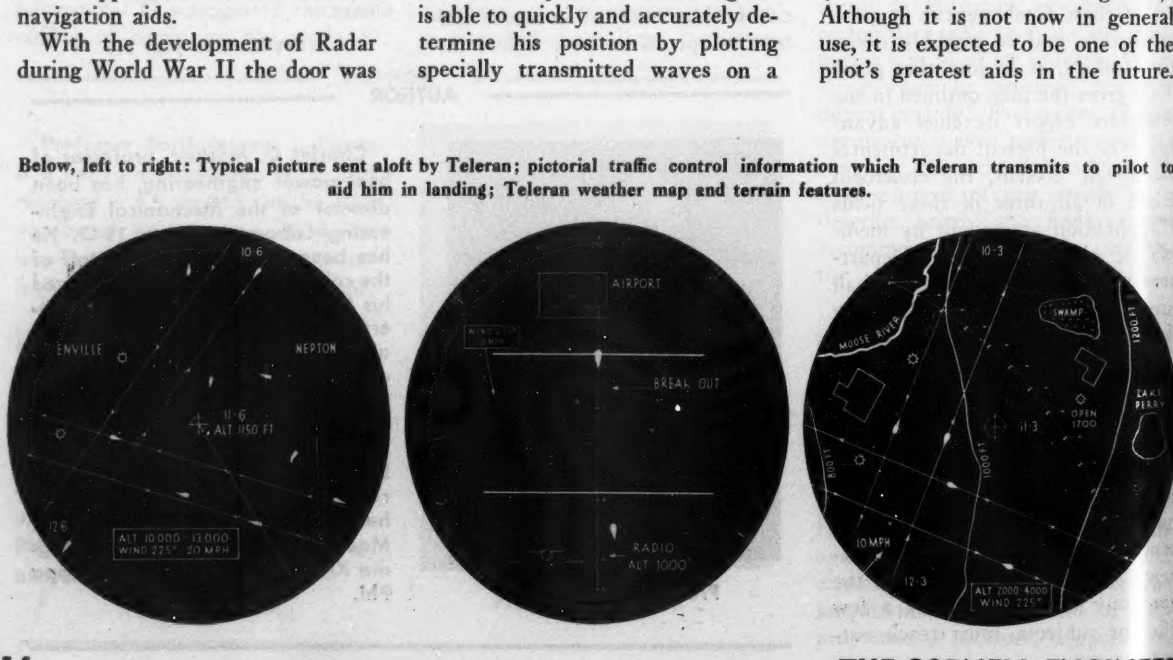
Left: Simplified diagram showing how Teleran transmits maps, details of landing fields, and other vital information to pilot of plane.

Recent developments in the field of electronics have indicated that in the future navigation will be a much simpler and more accurate job that it has been. As a result safety in both air and sea travel will be greatly increased. The accompanying pictures present a few of the applications of electronics to navigation aids.

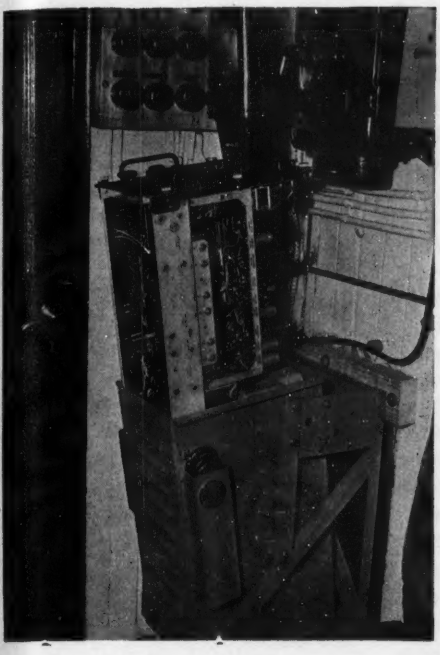
With the development of Radar during World War II the door was opened to the field of airborne electronic equipment. At the present time Radar is used chiefly in a navigation aid termed Loran (LOng RANge Navigation). In a recent test conducted on the Swedish-American Liner, Drottningholm, Loran was used and proved most successful. By its use the navigator is able to quickly and accurately determine his position by plotting specially transmitted waves on a Loran chart. Another application of Radar is on the absolute altimeter. It is now in use by the Army and Navy, and has proved invaluable in bad-flying weather.

That the future of electronics in aviation is not closed is indicated by the development of Teleran (TELEvision RAdar Navigation). Although it is not now in general use, it is expected to be one of the pilot's greatest aids in the future.

Below, left to right: Typical picture sent aloft by Teleran; pictorial traffic control information which Teleran transmits to pilot to aid him in landing; Teleran weather map and terrain features.



TO NAVIGATION



Above: Captain John Norlander of the Drottningholm and Edward Oschmann of Radiomarine examine a Loran chart as First Officer Jonnsson looks on.

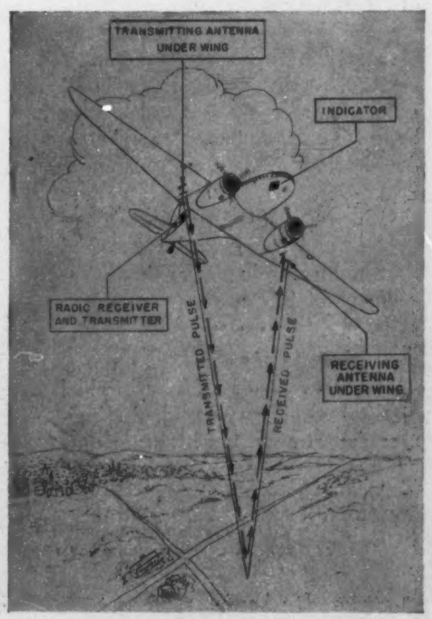
Above at left: Typical Loran receiving set, installed in the chart room of the Drottningholm.

With a single glance at his instrument panel, he is able to determine terrain features, meteorological data, and traffic control information, regardless of weather conditions. Teleran overcomes the chief disadvantage of air-borne Radar by removing most of the heavy equipment from the plane. However, it is in the field of traffic control that Teleran will probably prove most valuable.

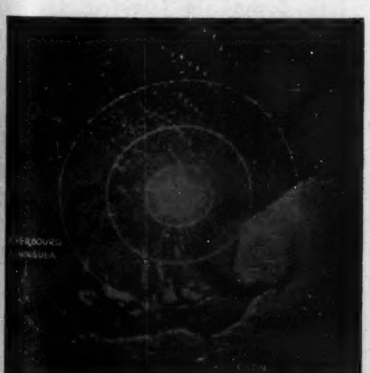
—All pictures courtesy of R.C.A.

Charles J. Pannill

President of Radiomarine Corp. of America, which was instrumental in developing ship-borne Loran.



At right: Radio altimeter gives exact height of plane by measuring elapsed travel time of microwave pulse to ground or water and return.



At left: Radar scope showing coast of France on D-Day.

NEWS OF THE COLLEGE

One of the highest of chemical honors, the Willard Gibbs medal, was awarded to Linus Pauling, who was the George Fisher Baker lecturer at Cornell, and at the present time is head of the Division of Chemistry and Chemical Engineering and director of the Gates and Crellin Laboratory of the California Institute of Technology. The award is made to "anyone who, because of his eminent work and orginal contributions to pure and applied chemistry, is deemed worthy of special recognition." Programs for the meeting carried this tribute. ". . for eminent work and original contributions in chemistry and related scientific fields, through the determination of many molecular structures, interatomic distances, bond angles and covalent radii of atoms; for quantitation of the classical theory of electronegativity; for extension and application of the resonance principle to chemistry; and for the formulation of a frame-work theory of antibody formation, we honor Linus Pauling."

Enrollment

The College of Engineering leads the university in the number of veterans enrolled, having an enrollment of 1,809 ex-servicemen, as announced by the Office of Veterans' Education. The total number of veterans on the campus totals 5,031, or 55.5 per cent of the entire student body. This number is more than double the approximate number of 2,458 veterans in attendance for the Spring, 1946 term. The college of Arts and Sciences places second in veteran enrollment with an enrollment of 973 ex-servicemen.

Appointments

David E. Donley, formerly chief of the hydrology unit, U. S. Engineer department, has been appointed acting associate professor of civil engineering.

George F. Bush, a graduate of Lafayette College, is acting associate professor of machine design.

Taylor D. Lewis, recently discharged from the United States Army with the rank of Lieutenant Colonel, has been appointed assistant professor in civil engineering. Herbert F. Wiegandt, an engineer in the Armour Research Foundation in Chicago, has also been appointed to the faculty of the College of Engineering.

Other new assistant professors are: John Baird and Charles I. Seeger in electrical engineering; Malcolm S. Burton, former instructor at Massachusetts Institute of Technology, in metallurgy; Norman R. Gay, formerly with Eastman Kodak, in heat power engineering; Robert M. Mains, former instructor at Johns Hopkins in civil engineering; and Frank Maslan, a former research and development engineer.

Richard Parmenter, '17, former director of research for the Civilian Pilot Training Program at Cornell, and commander of the Austin subarctic expedition in 1927, has been appointed administrative assistant to Provost Arthur S. Adams.

Lincoln Ried, Robert Lee Von Berg, John M. Wild, and Stanley W. Zimmerman have been made associate professors. A former army officer, Ried will teach hydraulics in the Civil Engineering School. Von Berg, who was with DuPont, will instruct chemical engineering. Wild, former supervisor of aerodynamics for Northrop Aircraft, will teach in the graduate school of aeronautical engineering, and Zimmerman will assume the duties of acting associate professor in the high voltage laboratory.

It was recently announced by Dr. Clifford C. Furnas, laboratory director at the Cornell Aeronautical Laboratory, that William M. Duke, 30 year-old aeronautical scientist, had been appointed manager of the guided-missile program "to maintain adequate guidance and co-ordination."

The new manager, formerly associated with Douglas and Consolidated-Vultee Aircraft Companies, holds a master's degree from the New York State University Guggenheim School of Aeronautics. He joined Curtiss-Wright eight years ago and remained with the laboratory when it was donated to Cornell.

Dr. Furnas said, "We have already made great strides in missile research, and our contributions some day will be recognized as significant advances in the field of aeronautical science."

Fellowship

Joseph C. Yarze, who has been awarded the Standard Oil of Indiana fellowship for fundamental research in chemical engineering, has accepted a position as graduate fellow at Cornell University.

Special Student

AWARD OF the Bronze Star Medal and an Oak Leaf Cluster to Major Robert S. Kramer, presently assigned as a special student to Cornell, was announced by Colonel Ralph Hospital, ROTC Commandant at Cornell. Major Kramer has been sent to Cornell by the War Department to do graduate work in engineering which he expects to complete by June 1947. Upon graduation from West Point in 1941 Kramer was sent almost immediately to the Philippine Islands where he became one of the Philippine Scouts. As a young engineer officer and platoon leader he assisted in building fortifications and defenses at Bataan. Cut off by the Japs during the last few days at Bataan, Kramer with ten others escaped in an assault boat, later landing at Cavite. By March, 1944 he was the only survivor of the group. Later taken from the Philippines to Australia by submarine, he was then transferred to the U. S. for advanced officers training. In January, 1945, Kramer was returned to the Pacific Theater as a member of General McArthur's staff. For outstanding service during this period, he was awarded the Bronze Star Medal.

PROFILE

Clyde Walter Mason

The tall figure of Professor Clyde W. Mason is a familiar sight to all future Chemical Engineers who frequent Olin's halls, and almost a little frightening to the Freshmen who know he will lecture to them when they are Juniors. The "Professor of Chemical Microscopy and Metallography in the School of Chemical Engineering," to give him his official title, teaches courses in materials of construction, chemical microscopy, and metallography. Chemical microscopy, as Professor Mason's students can tell you, involves the study of microscopical properties, behavior, and identification of chemicals, materials of construction and manufactured products. This course is required of all Chem.E.'s both to enable them to use these methods and to inform them about the small scale side of operations and behavior in technology. In lectures on materials of construction, the properties of materials governing their selection and performance in chemical engineering applications are discussed. Metallography covers the microscopical study of metal structures and alloys. Professor Mason, who is in charge of the Olin library, also gives a course in the use of chemical literature.

After graduating from the University of Oregon in '19 with an A.B. degree, Professor Mason studied there another year to obtain his Master's degree. In the fall of '20, he came to Cornell as an assistant in chemical microscopy and received his Ph.D. here four years later. A Heckshet Research Fellow in the early '20's, he studied the structural color in birds and insects. His work culminated in a full Professorship in 1933. During the time he was a member of the chemistry department in Baker, Professor Mason was in charge of the chemical library which he reorganized and reclassified. On the completion of Olin, he joined the Chemical Engineering staff, and was given the title which he now holds.

Professor Mason has done extensive research in chemical microscopy and metallography and is author or co-author of more than forty papers on different topics in these fields. For a number of years he held the position of Chairman of the Educational Committee of the American Society of Metals, and has just completed a book, *Introduction to Physical Metallurgy*, which will be used as the basis of educational lecture courses given by the society. A book, of which he is co-author, is the two-volume *Handbook of Chemical Microscopy*. Professor Mason has developed elementary and advanced courses in this field and in metallography and physical metallurgy. Numerous lectures on chemical microscopy and the behavior of metals have been presented by him before the American Foundrymen's Association, American Society for Metals, and the American Chemical Society; he helped to found and was the first Chairman of the Division of Analytical and Micro Chemistry in the last-named organization. During the war Professor Mason was a technical representative of the National Defense Research Committee of the Office of Scientific Research and Development, and worked on confidential problems in connection with the Chemical Warfare Service. He maintains contact with the industrial field through his students and by means of a certain amount of consulting work.

(*Continued on page* 38)

Prof. C. W. Mason

PROMINENT

Alison

Alison King, Arch

As a sophomore in Amherst Central High School in Snyder, Alison King began to examine architecture as a career for women. In her senior year she visited an architect's office in Buffalo, just to see where she might eventually fit in. The architect was blunt: "Isn't there *anything* else in the world you'd rather do than be an architect?" With this "encouragement" ringing in her ears, she entered Cornell in September 1940. The way she explains it, her dad's an engineer (Cornell M.E., '12) and her mother was an art teacher and interior decorator before her marriage . . . add them up and what do you get? Architect of course!

As a frosh, Alison made top average for women in the College of Architecture, along with participating in sports and joining Delta Gamma. Her sophomore year she became a member of Alpha Alpha Gamma, national women's honorary for architecture and the allied arts. Sage Chapel choir and sports rounded out the program that year.

When the Curtiss-Wright Cadette Engineering program came along in the Fall of '42, numerous co-eds all over the U. S. jumped at the chance to train for jobs in the aircraft industry. Alison was among twenty or thirty girls who left Cornell for a year's training elsewhere; she went to the Pennsylvania State College as a "Cadette" and there became just another blue-jeans-clad student. She found time to be active in her sorority at State, as well as work on the *Penn State Engineer*. December 1943 found Alison graduating from this accelerated aeronautical course, and soon she was working in the Buffalo Curtiss-Wright plant, first on the "boards" and later in the Aerodynamics section of the Engineering Department, doing performance calculations and design work on some of those "hot" ships that never saw the war. Nineteen months of war service at Curtiss was Alison's contribution, and with the end of the war she planned to return to Cornell.

Returning in November, 1945 as a second term Junior, she picked up just where she'd left off, and found it wonderful to be back. She didn't suffer from the years of "engineering," for she claimed top women's average in Architecture again last year. And now, in her final term of her checkered career at Cornell, Alison is looking ahead to graduating next February, and she's out to discover just what they *will* let a woman do in this field. Residential architecture is her ambition, with an eye on the low-cost housing problem. "Work a few years and then settle down in a home of my own design, hoping it doesn't fall down around my ears; no doubt the 'man of the house' will have some pet ideas on how it should be built too!"

Anybody in the market for a house?—here's your architect!

Howard Blose, ChemE

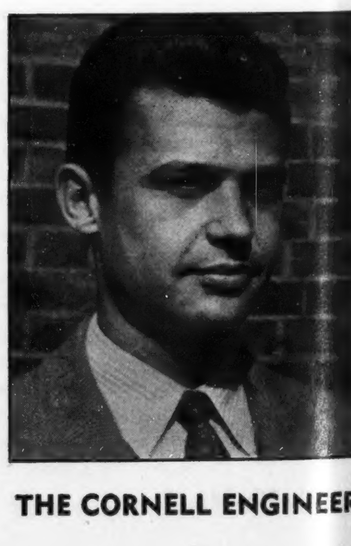
Howard Blose, one of the many veterans on the campus this fall, returned to the first session of Cornell summer school last summer after two year leave of absence serving in the Navy.

Howard, better known as "Howy," is primarily interested in sports (next to his Chemical Engineering, of course.) Participation in athletics occupied most of his free time in Oakwood High School in Dayton, Ohio, his home town, from which he graduated in 1940. He was lettered for four years in football, track, and basketball, not to mention his hobbies, weightlifting, swimming, and canoeing, which he kept as sidelines. During "Howy's" first days at Cornell, his brilliant career in football and track made him a widely known student. In 1943 he was an Honorable Mention All-American back on the A.P.-U.P. Team under Carl Snavely. While studying for his B.S. in Chemical Engineering, which he received in March 1944, he was an active member of the Football Club, Sphinx Head, Spiked Shoe, Kappa Beta Phi, Al-Djebar, Aleph Samach, and Psi Upsilon; in 1943 he was president of Psi Upsilon. And then "Howy" added another award to his already large collection when he won the Jack Moakley Track Trophy for Discus Throw 1941-42.

"Howy" ended his college career in uniform, as a V-12 in 1943, Cornell Midshipman 1943-44, and finally graduation as an ensign in June of 1944. During his two years of active duty in the Navy in the Pacific Theater, Saipan, Okinawa, and Japan, Ensign (and later Lt., j.g.) Blose served as Commanding Officer of Landing Craft Support Ship. He was honorably discharged in May, 1946.

His many Cornell friends, both old and new, are glad to see "Howy" back in Olin again, and they wish success to him, a great athlete and Navy man, who has and will bring honor to his Alma Mater.

Howy



ENGINEERS

Berten E. Ely, ChemE

The "Blue Beetle" has had more women in it during its short span of life with Berten E. (mmn!) Ely than any other jeep you ever saw. But it is a good and friendly jeep, picking up lads and lassies from all over the mountainous hinterland, whenever Bert thinks they might want a ride.

Bert was born in Morristown, New Jersey, on January 3, 1923, and when he was two, moved to Florham Park, where his father is an aquatic horticulturist. So it was that horticulture became Bert's first love. Even now when his research project, "Heat Transfer to Boiling Liquids," becomes too hot, he wonders if water plants aren't more to his fancy.

In September, 1940, he entered the School of Chemical Engineering at Cornell. As a freshman and sophomore he found time to be on the track team, to do outside work for his board and room, as well as to stay in Chemical Engineering. Summers he worked for Picatinny Arsenal and for DuPont. Anticipating the bugle call, he left school in the spring of 1943 to work in DuPont's plastics division for a few months.

Bert had his basic training and then was sent to ASTP at Stanford University where he won his letter in track. After spending Christmas on maneuvers in the swamps of Louisiana, he went overseas to help Patton chase the Nazis out of France, Germany, and Czechoslovakia.

Bert

Returning to Cornell in November, 1945, Bert became Vice-president of Alpha Chi Sigma, professional fraternity in chemistry and chemical engineering. He is now president or Master Alchemist of A.X.E. He again was elected Secretary-Treasurer of the A. I. Chem.E. and was elected into Al-Djebar, honorary chemistry fraternity. Bert aided the government in paying for finishing his education by holding a McMullen Scholarship and by instructing in organic chemistry. Last summer, between golf and tennis, he managed to do half of his senior research and plant design.

Bert will be graduated in February, 1947, after which he hopes to return to his beloved Jersey to be a Chemical Engineer in name, and perhaps a horticulturist at heart, and if ever the twain should meet, Bert will have found his niche.

John Otts Brown, EE

"Breather" Brown's 6′3″ prominent frame descended upon the Cornell campus in July of 1943 as one of numerous transferred Navy V-12 students. He had traveled far from Birmingham, Alabama, via the Lawrenceville Preparatory School and Princeton University; however he had not lost the genial captivating characteristics of the deep South. His (self-acclaimed) Northern accent was soon noticed in the Electrical Engineering School, nonchalantly conversing on the concepts of imaginary roots and abstrusive electro-physical phenomenon.

While establishing himself as a very capable student, "Breather" quickly became amalgamated with the Cornell Social Life. As a member of Pi Beta Tau, the Delta Club, and Beta Upsilon, John displayed his natural talents and capacity as a student leader. In these exclusive social societies, John Otts Brown soon assumed the roll of administrator and organizer. It was John alone who could obtain all the ne-

John

cessary essentials for consistent activities. Breather's 1930 Ford, "The Beetle," could always be counted on for sure transportation. Shortage of materials were no obstacle. Substitution of "cleaning fluid" for gasoline was inconvenient, but "picnics" to Truman, Treman, and the Old Mill continued.

Wells College was a particularly fertile field for young gentlemen in those days; and for some time, week-ends found John consistently absent from the Hill. In fact "Breather" was accepted as a semi-permanent fixture at Wells and was greatly appreciated by specific individuals there. However he somehow kept up his extra-curricular activities at Cornell, serving as manager of the Cornell soccer and hockey teams. Nicky Bawlf has often asserted that no manager ever shielded him better from the icy winds sweeping across Beebe Lake during hockey games.

"Breather" received a degree of Bachelor of Science in Electrical Engineering in October, 1945. During his career in the Navy he commanded the LCI (L) 579, as youngest "skipper" in the U. S. Navy.

John returned to Cornell this Fall and will receive a Bachelor of Electrical Engineering Degree in February. He is at present an instructor in calculus.

John is still a very active member of the Sigma Alpha Epsilon Fraternity. Greatly admired and respected by those who know him best, John has always set a good example for his fellow students.

Recent Developments In Engineering

Techni-Briefs

Tortured Metals

Breaking, twisting, and bending hard metals with compressed air is the new method to determine the strength of metals and alloys.

An air-pressure machine, the operating principle of which is similar to that of a slide trombone, is used to vibrate metals and alloys at their natural frequencies until they crack or break under the stress and strain, thus determining their durability for actual operating conditions.

Performed with a pneumatic fatigue-testing machine, the new method is the most rapid method of fatigue testing, and it is expected to bring radical changes in that field.

Originally developed to test gas-turbine buckets, the device has proved so efficient and adaptable that it will undoubtedly have wide industrial application.

The fatigue tester is so simple that even a high school student can operate it. The operating mechanism consists of a tuned air column in which the tuning is accomplished by decreasing the length of the air path, much as a trombone player changes the tone of his instrument by moving the slide.

The fatigue life of any metal may be tested by this instrument. The metal buckets of gas-turbine aircraft engines, used in such planes as the powerful P-80 Shooting Star, may be tested on the pneumatic machine under the same high temperature conditions as they experience in actual operation.

Tests can be run at temperatures as high as 1,700 degrees Fahrenheit.

Actual parts of the gas-turbines and electric devices, rather than samples of the metals, may be tested with the new machine, which is so accurate that even the start of a crack may be detected.

Metals or parts of equipment to be tested are attached to a piston which fits loosely into two cylinders. Air pressure is directed through the cylinders so that it vibrates at the same natural frequency of the metal being tested. An optical system is used to measure the amount of vibration, while an electric meter at the base of the machine records the resonating frequency of the piece being tested. Charts are kept to determine the number of stress reversals the metal can withstand before it fatigues.

The machine has produced stresses as high as 100,000 pounds per square inch, with no more air being used than that supplied by the average vacuum cleaner.

The fatigue-tester has no moving parts to wear out, as nothing moves but the piece of metal under test. Three different models have been built, all operating on the same principle, but different in size for holding varied sizes of materials to be tested.

Silicone Resins

You can throw away your polishing rag and cease worrying about the paint job on your car when lifetime finishes for automobiles are perfected by the use of new silicone resins now being developed.

Progress being made in the development of silicones, the new materials derived from sand, indicates that within five years, autos, refrigerators, electric ranges, and hospital equipment will be finished with a silicone paint that will retain its original color and gloss permanently. In addition it is expected that brighter and clearer colors will be obtained with the silicone materials.

Tests of the paint, still in the developmental stage, show that the silicone product is highly resistant to severe weather conditions, chemicals, and heat.

Tests in which silicone-treated panels have been immersed in acid and alkali solutions, reveal that the new product will retain all its original characteristics while materials now commonly used would deteriorate.

Application of the silicone paint to refrigerators, ranges, and hospital equipment would prevent discoloration frequently caused by hot greases, fruit jucies, iodine, and other chemicals.

New Individual Adhesive

A new industrial adhesive that requires no catalyst or special preparation for use has recently been developed. This adhesive, called No. 4665 cement, was described as being tough and flexible, suitable for bonding metal foils and metal sheets to wood, plastics, vulcanized synthetic and natural rubbers, as well as other substances having widely different coefficients of thermal expansion.

No. 4665 can be applied without thinning, by brushing, roller coating, knife coating, or dipping. It contains 27.5 percent solids. Although insoluble in water, its bond strength is lowered by continued immersion. However, original bond strength is regained after removal from water.

The dried adhesive film is resistant to dilute alkalis, acids, and corrosive salt solutions. It is not attacked by petroleum or coal tar solvents, lubricating oils, alcohols, ethylene glycol, or vegetable oils, but is soluble in ketones or exter solvents. Moreover the cement is resistant to mildew and fungi.

It is expected this new tool for industrial engineers will find application in the following fields: Metals, woods, plastics, fabrics, ceramics, vulcanized rubber, paper, natural and artificial leather, plaster and wallboards, concrete and glass.

(*Continued on page 26*)

Modern Glass Craftsman
Present-day version of the ancient glass blower at work fabricating complex electronic tubes.
—Courtesy Westinghouse

erior-
paint
ospi-
dis-
y hot
and

e
that
prep-
been
l No.
being
for
heets
syn-
well
videly
al ex-
thout
coat-
g. It
Al-
bond
inued
bond
noval
resist-
l cor-
t at-
l tar
ohols,
oils,
exter
ent is
gi.
ol for
l ap-
ields:
, cer-
paper,
plas-
and

an
he an-
fabri-
pes.
Vinghouse

EER

Cornell Society of Engineers

107 EAST 48TH STREET 1946-1947 NEW YORK 17, N. Y.

ROBERT B. LEA, *President* .... Lake Success, L. I., N. Y.

CARL F. OSTERGREN, *Executive Vice-President* 20 Rockwood Road West, Plandome, N. Y.

PAUL O. REYNEAU, *Secretary-Treasurer and Representative, Cornell University Placement Service* 107 East 48th St., N.Y.C.

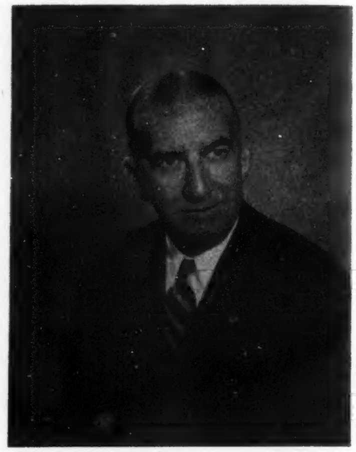
KARL J. NELSON, *Recording Secretary* .... 112 Orange Ave., Cranford, N. J.

FURMAN SOUTH, JR., *Vice-President* .... 1140 Wightman St., Pittsburgh, Pa.

WILSON S. DODGE, *Vice-President* .... 327 Montgomery St., Syracuse, N. Y.

CREED W. FULTON, *Vice-President* .... 4200 Wissahickon Ave., Philadelphia, Pa.

KARL J. NELSON, *Vice-President* .... 112 Orange Ave., Cranford, N. J.



"The objects of this Society are to promote the welfare of the College of Engineering at Cornell University, its graduates and former students and to establish a closer relationship between the college and the alumni."

President's Message

On October 15th I had the pleasure of picking up Dr. Robert F. Bacher at our neighbors, the United Nations, at Lake Success, and motoring him to town for his talk with the Cornell Society of Engineers that evening. This gave me a rare opportunity to become acquainted with a great scientist, a keen mind and a particularly human individual when one considers the grave matters with which he is concerned.

One can commence to understand the wide background necessary for pioneering work in nuclear physics, radar and atomic energy, which are Dr. Bacher's specialties, when it is considered that he got his first degree, a B.S. in Science, from Michigan in 1926, and for the next eight years continued his study, research and fellowships at Michigan, California Tech and M. I. T., then back again to Michigan, before starting his instructorship at Columbia. In 1935 some long-sighted individual or group persuaded him to come to Cornell. In Ithaca he rose from various instructorships and professorships to be Dircetor of the Laboratory of Nuclear Study and Professor of Physics in 1945.

I have, naturally, read a great many things on atomic energy and "the bomb" in the last sixteen months, but nowhere have I seen or heard anything that so clearly set forth the sequence of the development over the years of this great new power which is now in our hands as did Dr. Bacher in his illuminating talk. He interspersed his narrative with anecdotes of some of the incidents which helped relieve the tension during the hours in which they were assembling and exploding the first atomic bomb in New Mexico in July, 1945.

Now to Dr. Bacher has come the honor and great responsibility of being appointed, by the President, as a member of the Atomic Energy Commission, which is charged with the direction and operation of the country's whole atomic energy program. At the recent Herald Tribune Forum, where he spoke with Mr. Baruch and others, Dr. Bacher said:

> "Many scientists are today eager to apply the nuclear reactors and the radio-active materials of the atomic-energy development to advancing our knowledge of medicine, biology, chemistry and physics. The physicists who worked on the scientific problems of the atomic bomb still find themselves without any real understanding of the atomic nucleus. Scientists realize that these problems can best be solved in a world at peace where freedom for mutual interchange of ideas exists. This freedom will never exist if people live in fear of sudden war. It is therefore necessary to have a peace-time development of atomic energy under a system in which the destructive uses are prevented.
>
> "By this technical nature of the problem, there are many points in the production of the necessary fissionable materials where these materials can be directed either toward peace or war . . .
>
> "Science is, by its nature, universal and international. Under an effective international system of control, we can expect that the interchange of scientific ideas and information will play an important role in the development of atomic energy and give added strength to the international control organization."

* * * * *

The Cornell Society of Engineers thus feels honored in having had Dr. Bacher with us for our opening meeting and wishes him every success in the grave duties he now undertakes.

ROBERT B. LEA

ALUMNI NEWS

Four Cornellians have been appointed to the staff of Brown University. John H. Marchant, AM '28, PhD '33, is Professor of Mathematics and Director of Research in the Graduate Division of Applied Mathematics. Formerly a project engineer with Pratt and Whitney Aircraft Corporation, he held the rank of lieutenant commander during the war. George F. Carrier, ME '39, PhD '44, is Graduate Instructor in Machine Design. During the summer of 1943, he worked with Pratt and Whitney Aircraft Corporation. Rohn Truell, PhD '42, and

---

James A. Krumhansl, PhD '43, both former graduate assistants at Cornell, have been appointed Assistant Professors of Physics at Brown.

Everett G. Ackart, ME '05, retired September 1 as chief engineer of E. I. duPont de Nemours and Co., Inc., Wilmington, Del. Starting with the company in 1907 as a junior engineer, he became its chief engineer in 1927. In recent years, he supervised the design and construction of more than a billion dollars worth of war plants which du Pont built and operated at the Government's request.

Joseph F. D. Hoge, ME '06, has retired from the patent department of Bell Telephone Laboratories, Inc.

Clarence H. Swick, CE '07, of Capitol Heights, Md., retired from the Coast and Geodetic Survey after more than thirty-eight years' service as a geodetic engineer. At the time of his retirement he was chief of the section of triangulation.

Charles W. Linsley, CE '07, was appointd City Engnieer of Oswego to succeed Charles H. Snyder, '02, who has resigned. Linsley retired May 1 as general manager of the McPhail Chocolates Corporation of New York.

Colonel Leonard C. Urquhart, '09, former professor of Structural Engineering, now chief of the engineering division of the US Engineers District Office in Honolulu, Hawaii, was awarded the Legion of Merit in a ceremony at Fort Armstrong. The citation commended his "engineering skill, unusual administrative ability, and loyal devotion to duty."

Captain Claude L. Turner, USNR, ME '13, has returned from a naval technical mission to Japan.

Christian Schwartz, CE '14, has a six months' appointment as project engineer for the Federal Housing Authority, in Cleveland, Ohio. He has been assigned to Grand Haven, Michigan, to assist in the conversion of army barracks into living units for veterans.

George O. Kuhlke, ME '14, has become the vice-president and general manager of the Arma Corp., Brooklyn, of which he has been secretary. He has been instrumental in the achievements that the company has attained in the development and design of gun fire control for the Navy.

Charles S. Whitney, CE '14, MCE '15, is consulting engineer in the firm of Ammann and Whitney, N.Y.C., and has contracts to design two huge aircraft hangars at the Chicago, Ill., municpal airport. The hangars, estimated to cost $2,500,000 each, will incorporate the concrete arch design developed and patented by Whitney.

Knibloe P. Royce, ME '16, has resigned from the Otronics Co. of America and returned to his former connection, Cambridge Instrument Company, New York City, as sales manager of the electro-medical apparatus department. He is also president of a new company, Larchmont Machinery Corporation, formed to import and sell an English book lining machine.

Edward H. Lewis, ME '21, has been elected president and treasurer of Western Insulated Wire Co., Los Angeles, Cal., and is now the sole stock holder.

Frederick Abel, ME '30, is factory manager for Corrugated Container Corp., Columbus, Ohio. He was previously production engineer for Bendix Aviation Corp.

Harold B. Vincent Jr., EE '31, is a partner in Bowie-Vincent Motor Co., DeSoto-Plymouth dealer. He returned from the Philippines last year and set up the business the month after he was discharged from the Navy.

William H. Lauer, Jr., BS '34, resigned from Paul and Backman Company last January to become production manager of the coil department of Merchant and Evans Company, Philadelphia, Pa.

J. Ward Simonson, ME '39, has become assistant factory superintendent of Lucidol Division, Novdel-Agene Corp., Buffalo, N. Y.

Russell L. Hopping, ME '40, is a special research engineer with Glenn L. Martin Co., Baltimore, Md.

Henry W. Jones III, BME '42, is now assistant to the chief engineer of American Tube Bending Co., New Haven, Conn.

Lloyd J. Moulton, BME, '42, is engaged in production engineering for Marguette Metal Products Co. in Cleveland.

Lieutenant Commander William F. Voecks, BME, '42, released to inactive duty in the US NR, is vice-president of William K. Stamets Co., machine tool business, Pittsburgh, Pa.

John C. Myers, Jr., EE '44, is an engineer for Morris Machine Works in Baldwinsville.

Charles H. Jamison, BME '46, is a design engineer with the aviation gas turbine division of Westinghouse Electric Corp.

on the beam

Successful Sidelines

There was quite a flurry in the press recently when it was disclosed that Jascha Heifetz, world famous concert violinist, is the composer of a popular swing tune. The song, we are told, was written on a dare and published under a fictitious name. With only modest plugging, it received wide approval, and was recorded by such artists as Bing Crosby, Bob Chester, Dick Jergens, and Margaret Whiting, none of whom knew the composer's true identity.

Such a successful change of pace (we refuse to say "prostitution of talent") is not too uncommon in the professional field. To give a few examples, we can cite the King of Swing, Benny Goodman, who has on occasion pulled Jascha's trick in reverse by appearing as soloist with leading symphony orchestras; and also actress-playwright Clare Booth Luce who has achieved mixed fame and infamy in her political digressions. We can mention, too, outstanding figures from the late poet G. K. Chesterton to the contemporary strip-teaser Gypsy Rose Lee who have added to their fame by writing successful mystery stories.

Yet with all this multiple talent drifting about in society, how often do we ever hear of an engineer who is famous in two different fields? Almost never! Do we attribute this state of affairs to the lack of versatility among engineers, to the lack of press agents, or merely to the lack of a more interesting pursuit?

Eliminating the Middleman

Relief agencies in rural Italy have, for quite some time, been adding bicarbonate of soda to raw milk, and have reported it a successful substitute for pasteurization. One of our up-and-coming production engineers suggests that they save lots of trouble by adding the bicarbonate to the feed and pasteurizing the cows . . . By the way, have you ever seen a burple cow?

The EE Writes Anode

Dear Eddy,

Watt do you zinc? I've been going around in circuits without any pieza mind Faradays. It's series, and all begauze of a little code with a pretty phase ohm I met ampere. Watt a coil! I can't resistor. She positively radiates. Meg is one of the fuse so far I relay conductor; her personality Lenz its cell to mine. She's variable and cable, and not impressed with her self inductance. I want to take megohm with me so my flux can meter. Armature if shield do it, but I'll dry celling her the idea. There's no resin why she shunt.

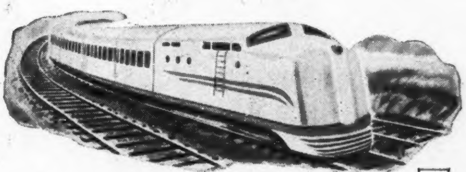
I had a triode with di-pole-o team, but I was Kirchhoff. They said I misplate the gain. Such impedence, I tickler! I gave them electron insulating flux and switched to the pole volt, Olmstead.

Have you ever Hertz of the can-condenser who wore a magnetron her farad and became a grid attraction? That's a choke, son.

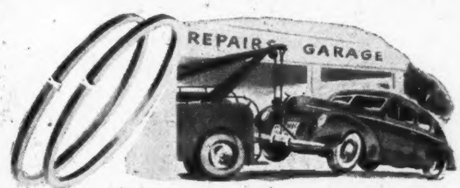
Well, oscillator,
Vector
B.A.L.

You saw us today . . . remember?

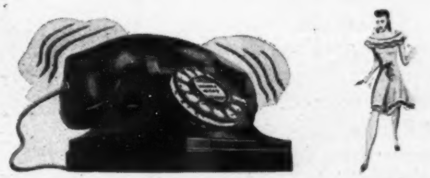
When you crossed the road 1 and saw that orchard . . . 2



or watched the train . . . 3 or bought a new dress . . . 4



left your car for repair . . . 5 or ordered roofing . . . 6



or took your vitamins . . . 7 or made a phone call . . . 8

you saw a Koppers product in use 9

KOPPERS

1. Tarmac. **2.** Flotation Sulfur Sprays. **3.** Pressure-treated cross ties. **4.** Chemicals for dye intermediates. **5.** Piston rings. **6.** Roofing. **7.** Chemicals for pharmaceuticals. **8.** Chemicals for molded plastics. **9.** Coke plants. All these are Koppers products . . . and many others that touch your welfare in countless ways. The Koppers trademark is the symbol of a many-sided service. Wherever you see it, it means top-notch quality. Koppers Co., Inc., Pittsburgh 19, Pa.

Techni-Briefs

(*Continued from page 20*)

Two-Way Talking Lamp

Existence of a "talking lamp," which emits infrared radiations enabling secret two-way conversation over an invisible searchlight beam, has been disclosed recently.

The source of the unseen radiations is caseium vapor. Although an efficient generator of infrared, caesium is a poor visible illuminant, thereby qualifying it for confidential telephonic assignments. It is possible to transmit words practically instantaneously with true telephone quality and at normal conversational speed with this lamp.

The caesium vapor lamp was designed at the request of the U. S. Navy for convoy duty and for issuing troop landing directions. A feature particularly attractive to the Navy is that, unlike radio, there can be no eavesdropping or jamming of infrared "beamcasting." Jamming would require the use of a "shutter" device within the limited 25 degree beam, as the message is restricted to listeners within the beam spread.

By V-J Day about 3,500 of the 100 watt lamps had been shipped to the Navy, but the auxiliary equipment was not obtained in time for use in combat. During peacetime the lamp is expected to prove useful in confidential ship-to-shore communications where radio wavebands might be objectionable; in conveying messages among pilots flying through radio "blackouts" in close formation or a few miles apart; or in disaster areas where telephone lines are cut and climatic conditions make radio broadcasting impossible. Infrared beamcasting is unaffected by static and all weather except extremely soupy fog or smoke.

Filling a gap between radar and "walkie-talkie" infrared beamcasting is similar to radio broadcasting except that the sound is carried over ultra-short wave lengths rather than long wave lengths. The waves, transmitted over a carrier wave having a frequency 350 million times the normal broadcast band, have a distance or horizon limitation similar to that encountered in television.

View of the Talking Lamp —*Courtesy of Westinghouse*

The lamp itself serves as the transmitter. When mounted on a ship's mast in a parabolic searchlight-like reflector, it picks up words spoken into a microphone from the ship's pilothouse or deck and provides wings for the voice to reach the receiving station on another ship or a shore station. At the receiving station, a photoelectric cell mounted in another parabolic reflector picks up the infrared rays, and with suitable amplification converts them into a reproduction of the spoken words.

The key to broadcasting with light beams is the ability of the lamp to alternately dim and brighten, thousands of times a second, a requirement necessary in order to truly reproduce by wave lengths the varying tonal qualities of the human voice, which range in pitch, or frequency, up and down the musical scale.

In this characteristic, called modulability, the caesium vapor lamp has maximum efficiency, reaching a peak of 100 per cent at some points in the entire usable audio-frequency range of 200 to 3,000 cycles a second. By contrast, a 60 watt household lamp can be modulated a maximum of only one-tenth per cent.

The "talking lamp" accepted by the Navy is 13 inches long overall and produces its radiation from an arc stream 3 inches long and 1¼ inches in diameter. It is filled with argon gas and caesium vapor. To conserve heat, the inner bulb is mounted within an outer bulb and the intervening space evacuated. The outer bulb, two inches in diameter, is banded with padded metal strips between two ridges in order to maintain accurate alignment and support.

Monsieur Houdry

(*Continued from page* 11)

through hundreds of feet of pipe riddled with regularly spaced holes through which the vapors escape to come into contact with the catalyst for a few seconds. Formerly the catalyst was a mixture of silica and alumina found in fuller's earth, but now it is made synthetically. Every ten minutes the stream is switched to another case and the catalyst, which lasts about eighteen months, is regenerated. From the cracking case the synthetic crude, after going through a heat exchanger, is pumped to the fractionating tower where the gasoline, averaging more than fifty per cent on a single pass, is separated from the furnace oil and heavy gas oil. These heavier oils may be recracked either thermally or catalytically to obtain another, though smaller yield of gasoline. In the stabilizing unit the gasoline is separated (in the form required to give optimum performance in the engine) from certain gases which can be used as the raw material in other refinery processes. Catalytically cracked gasoline made by the Houdry process is of such quality as to need no further treatment to lower the sulfur content, improve its oxidation and color stability or gum content.

This beaker contains Houdry synthetic catalyst used in the catalytic cracking of petroleum.

The Thermofor Catalytic Cracking process, developed by Socony-Vacuum Oil Co., Inc. and licensed by Houdry Process Corporation, like all other catalytic cracking processes operates on the same basic principles as the fixed-bed method just described. In the T.C.C. process, catalyst moves slowly against the stream of ascending oil vapors, then are withdrawn from the bottom of the case, regenerated, and returned to the system.

The requirements of aviation gasoline are high: it has a lower and narrower boiling point range than motor fuel, greater oxidation stability, higher octane number, and consists mainly of saturated and aromatic hydrocarbons. In 1939 it was produced by combining a base of about seventy-three octane, straight-run gasoline distilled directly from scarce high-grade crude, iso-octane, and tetraethyl lead. Only a few years ago one hundred octane gasoline was such a rarity that a gallon sample cost thirty dollars.

Realizing the importance of air power in war and the need for suitable fuel for the planes, the Houdry Process Corp. built a large synthetic catalyst plant. Through research, they were able to raise the octane number of base stock, plus the amount of $Pb(C_2H_5)_4$ allow-

(*Continued on page* 30)

Monsieur Houdry

(*Continued from page* 28)

able for use in aviation gasoline, to ninety-seven and ninety-eight. Formerly thirty per cent or less of base mixed with seventy per cent or more alkylate (iso-octane) made a satisfactory aviation gasoline; with the improved base, only thirty per cent or less of the alkylate was necessary. Because the shortage of iso-octane and other hydrocarbons had slowed up production, the bottle neck was removed by the new development. All octane requirements can be met with blends of the new base and alkylate. Sun Oil completed the first Houdry catalytic cracking unit designed specifically for the production of aviation gasoline base in 1940. Only a few weeks after Pearl Harbor, Sun aviation gasoline plants at the Marcus Hook and Toledo refineries had tripled their prewar production, and four months later had raised it to five times their prewar output. Five major refiners were operating Houdry fixed-bed catalytic cracking units when war came to the United States.

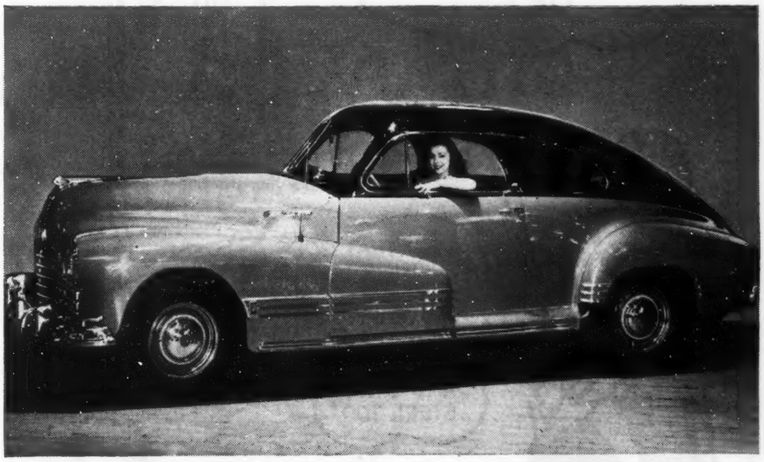
On October 27, 1943, at an elaborate ceremony at which PAW Ickes and other high-ranking officials delivered addresses, Sun dedicated Plant Fifteen in Marcus Hook. This aviation gasoline installation cost thirteen million dollars and covers one hundred twenty-three acres of land near the Delaware River. It consists of a six-case Houdry catalytic cracking unit, alkylation unit, the largest in the world, a gas recovery and stabilizing unit, and auxiliary equipment. The cracking unit, arranged in two sets of three cases each, is charged with one hundred twenty-five tons of specially developed synthetic catalyst. Molten salt is circulated through the cases, as in the Houdry cracking units in other refineries, to supply heat during the on-stream period and remove excess heat of combustion when the coke is burned off the catalyst. While oil vapors circulate through one case in each set, air is blown through another to burn off the coke, and the third

(*Continued on page* 32)

Du Pont *Digest*

Items of Interest to Students of Chemistry, Engineering, Physics, and Biology

Chemistry Provides New Colors for New Cars



In Detroit this spring, automotive engineers and designers were shown a dozen cars finished in glowing colors never before seen on any automobile—colors that diffused and reflected light back to the eye from within the finish instead of from the surface.

These new "Duco" Metalli-Chrome lacquers which attracted industry-wide attention are expected to give new beauty and durability to America's cars. The story behind their development is an interesting one.

New Techniques for Pigment Preparation

As many commercial pigments are now made, they are precipitated from chemical solutions in the form of fine particles, which are then dried, ground and reground with a liquid vehicle to produce the final paint, enamel or lacquer. The fineness of the particle-size largely determines the luster of the finish. Although mechanically ground pigment particles can be made extremely fine, they are not nearly as small as the particles originally precipitated.

A few years ago a program of research was started by Du Pont scientists to try to take advantage of the very fine particles formed by precipitation. They proposed to eliminate the drying and grinding processes entirely—to transfer the microscopically sized, precipitated, hydrated pigment particles directly from the mother solution to the lacquer vehicle.

Extended study by organic and colloid chemists, physicists and chemical engineers finally solved this problem. The procedure consists of mixing the wet pigment in a heavy-duty mill with water-wet nitrocellulose, dibutyl phthalate and castor oil. Dibutyl phthalate forms a colloidal solution with nitrocellulose. The colloid absorbs the castor oil and pigment, but eliminates the major portion of the water as a separate insoluble phase.

A New Range of Color Effects

After the method of transferring wet pigment particles had been established, the second development in this program was the practical utilization of precipitated ferric hydroxide. Although it had been used for a long time as an intermediate for the manufacture of dry ferric oxide pigment, ferric hydroxide in the wet form as a pigment had been applied only to a very limited extent and its true value had gone unrecognized. When used in conjunction with the new process, wet ferric hydroxide produced a lacquer of unusual brilliance and durability. In combination with other pigments, a whole new range of color effects became possible.

Because of their extremely small pigment particle-size, the Metalli-Chromes are somewhat translucent, having a distinctive, soft innerglow. This lustrous depth is further enhanced by introducing into the film aluminum particles which act like mirrors to reflect the light within the finish.

Not only are these new lacquer finishes more lustrous and more beautiful, but they are also more durable, as proved by four years of laboratory and road-testing. "Duco" Metalli-Chrome lacquer is a worthy newcomer to the ever-lengthening list of developments by men of Du Pont that have helped in the mass-production of automobiles and the creation of new industries, new markets, new jobs for millions of Americans.

Questions College Men ask about working with Du Pont

WILL I FIND COMPETITION DIFFICULT AT DU PONT?

It is to be expected that there will be competition in an organization where every effort is made to select the best trained and most promising graduates. However, such competition is not deliberate or is it on an elimination basis. New employees are given every opportunity to grow in the organization.

Technical undergraduates and graduate students will be interested in the new booklet, "The Du Pont Company and the College Graduate." Write to 2521 Nemours Building, Wilmington, Del.

More facts about Du Pont—**Listen to "Cavalcade of America," Mondays, 8 P.M. EST, on NBC**

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
... *THROUGH CHEMISTRY*

E. I. DU PONT DE NEMOURS & CO. (INC.)
WILMINGTON 98, DELAWARE

Monsieur Houdry

(*Continued from page* 30)

undergoes oil purging, air purging, and valve changing.

Shortly after the addition of Plant Fifteen, the Marcus Hook refinery was able to increase its crude-oil charging capacity to about one hundred and twenty thousand barrels per day; only a few refineries in this country and three refineries outside the United States had greater capacity. The new plant is large enough for the second pass treating of the entire first pass gasoline of other units at Marcus Hook. In 1944 Sun's total investment at Marcus Hook was in excess of sixty million, of which thirty-six million dollars were represented by facilities for the production of aviation gasoline. The second pass treatment removes undesirable olefins, unsaturated hydrocarbons, and improves the quality of the base stock. All of the isobutane needed for the alkylation unit is produced in other Houdry units at Marcus Hook, and this reacts with butenes from catalytic and thermal cracking and reforming processes to form isooctane. Plant Fifteen has its own boiler plant, water plant, and electric power substation. Most of the fifty million gallons of water used per day is used for cooling, and is taken from the Delaware without purification.

Having established an enviable record for aviation gasoline production, Houdry and TCC units are operating to produce better motor gasoline today. There are now seventy Houdry-licensed units in operation and under construction throughout the world, all of which represents well over fifty percent of the world's catalytic cracking capacity.

As a service to licensees of Houdry processes, the Houdry Laboratories at Marcus Hook carry out extensive research and development activities to continue the search in the magical field of catalytic reactions.

Heat-Power

(*Continued from page* 13)

The actual organization of this single department as recommended to the Sibley faculty by this committee report is basically different from present departments in the School of Mechanical Engineering. Special competence in the various phases of heat-power engineering would be rewarded by key professorships, possibly by endowed chairs, carrying prestige and salary to make them at least as attractive as the department chairmanship. It should be possible for outstanding members of this department to receive other rewards than the chairmanship of the department. These rewards might take the form of higher salaries or sabbatic leaves and reduced academic loads to permit research activities, specialized study, and the writing of engineering textbooks and technical papers. These key professorships would identify the holders with definite areas of specialization and might be in any or all of the following subjects:

(a) Thermodynamics
(b) Combustion
(c) Heat Transfer
(d) Steam and Gas Power
(e) Internal Combustion Engines
(f) Air Conditioning and Refrigeration

Laboratory Engineer

Another basic organizational change recommended in the report is the delegation of direct responsibility for the laboratory facilities and maintainence staff to a man whose duties would be somewhat analogous to those of a works manager. His title might well be *Laboratory Engineer*. He might have no academic rank and might teach no formal classes, but he should be a member of the faculty. He would be in charge of installing new equipment, maintaining laboratory apparatus and instruments, ordering materials, and supervising the many other housekeeping problems that arise in such a diversified laboratory. The heat-power department would do its own teaching in the laboratory. Other departments requiring laboratory facilities would do their own teaching in a like manner. The mechanical laboratory would be available for any department wishing to give laboratory instruction.

This plan should relieve the head of the new department of heat-power engineering of many tedious and time-consuming administrative duties and permit him to carry a moderate teaching load and thereby maintain close contact with the problems relating to staff, students, and course content. Direct responsibility for teaching in restricted areas would be left to the key professors, and direct responsibility for laboratory facilities and maintenance staff would be assumed by the laboratory engineer. The common error in the past has been to reward a man who attained distinction as a teacher or engineer by making him the head of the department; the next step was to load the department head with so many administrative or clerical duties that his effectiveness as a teacher or engineer was immediately reduced.

(*Continued on page* 36)

Wood specimens which show the excellent preservative qualities of Pentachlorphenol. The two pieces on the right were impregnated with this protection against decay. All four pieces were buried underground for six years in a Dow test plot.

Chemistry gives lumber longer life . . .

Growing trees can fight their own battles against many common destructive forces. Nature has seen to that. But power poles, fence posts and structural lumber are dead wood and suffer greatly from insect attack and the conditions that create decay. Here's where the chemist steps in and takes over nature's job to give lumber longer life.

During the past decade, notable progress has been made in developing preservative treatments for the protection of wood. Studies undertaken by Dow technicians have resulted in a new preservative known as Pentachlorphenol which is being used successfully without the attendant disadvantages of the older commonly used materials. Pentachlorphenol gives every assurance of greatly extending the useful life of lumber.

Development of chemicals for treating lumber is only one phase of the work that is constantly underway at Dow. Our interests range from ultra-light magnesium to chemicals that promote the health of the Nation and the progress of every industry.

The scientific mind and the scientific method are of first importance to Dow.

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit
Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE

Heat-Power

(*Continued from page* 34)

These changes in organization are summarized in the two organization charts. Fig. 1 shows the present organization and Fig. 2 the proposed one. This distribution of administrative responsibilities in the proposed plan has the following distinct advantages:

1. It removes all barriers, horizontal or vertical, to a well integrated series of courses in heat-power engineering.
2. It facilitates, rather than prevents, the use of the mechanical laboratory by other interested departments.
3. It creates key professorships and the position of laboratory engineer, thereby limiting the direct responsibility of any one man to the phase or area of heat-power engineering which constitutes his chief interest.

A possible arrangement of required courses in heat-power engineering for mechanical engineers is given in Fig. 3. This schedule of courses is meant to be only tentative and illustrative. It shows that the proposed plan is workable using the distribution of credit hours among the terms as provided in the five year curriculum for the two present departments concerned. If deviations from this distribution are permitted, perhaps an even better arrangement of courses could be made. Besides these required courses, elective courses at both the undergraduate and graduate level should be offered. Advanced courses in the three fields of application would be desirable and probably some or all of the fundamental subjects would justify more rigorous

(*Continued on page* 38)

Term	Course No.	Name of Course	Type of Course	Hours Credit	Hours Credit
7	1	Thermodynamics	Recitation	3	3
8	2	Instruments and Controls	Lecture and Laboratory	3	6
	3	Heat Transmission and Thermal Measurements	Recitation and Laboratory	3	
9	4	Fuels and Combustion	Recitation	2	6
	5	Steam and Gas Power Plants	Recitation and Laboratory	4	
10	6	Internal Combustion Engines	Recitation and Laboratory	3	6
	7	Air Conditioning and Refrigeration	Recitation and Laboratory	3	

FIGURE III PROPOSED SERIES OF COURSES IN HEAT-POWER ENGINEERING

Heat-Power

(*Continued from page* 36)

and extensive treatment in elective courses.

It is quite possible that a careful study of the subject matter taught in other departments of the Sibley School of Mechanical Engineering would indicate other advantageous combinations which would result in improved correlation and better continuity in the entire curriculum. Indeed, there is ample evidence that in recent years there has been a gradual evolution in this direction. Examples of this tendency are the organization of the Materials Department to include both classroom and laboratory courses, the combination of the Administrative and Industrial Engineering Departments into the single Department of Industrial and Engineering Administration, and the common Chairmanship in the Mechanics and Machine Design Departments. Perhaps the logical end is a School of Mechanical Engineering consisting of three departments. One of these, the Department of Heat-Power Engineering, would be concerned chiefly with instruction relating to sources, transformations, and transfers of energy. Another department, the Department of Materials, Mechanics and Design, would be concerned mainly with the mechanics of materials, properties of materials, processing of materials, and the design of machine elements. The third department, the Department of Industrial and Administrative Engineering, would be concerned principally with the economic and human relationships in mechanical engineerig. Specific responsibility in limited areas of these large departments could be designated by key professorships as has already been proposed for the new Department of Heat-Power Engineering. These three departments though fairly well defined, obviously have areas of common interest and overlap to some degree. This is almost inevitable in any classification of closely related material. The reduction in the number of these somewhat arbitrary divisions should result in better integrated and more nearly continuous education in mechanical engineering.

Profile

(*Continued from page* 17)

Alpha Chi Sigma, Sigma Xi, and Phi Kappa Phi claim him as a member, as does Al-Djebar, a social club for the pleasurable utilization of certain chemical products. Some of the technical organizations to which he belongs are the American Society for Metals, the American Institute of Mining and Metallurgical Engineers, the British Institute of Metals, and the American Society for Testing Materials.

Professor Mason's central scientific interest is the general subject of crystals and their behavior, both regarding chemical substances and engineering materials. The general aim in all his courses is to show the unity and relationships under this heading. Although Professor Mason is notorious for his rapid-fire delivery in lectures, students find him a brilliant and stimulating teacher. He prefers "thought" to "memory" questions, and believes strongly in the visual side of education, using numerous slides and microprojection demonstrations in his lectures.

Chemical Engineering

(Continued from page 8)

within this school and to it were assigned those courses that deal specifically with metallurgy.

Until 1942, all of the work in chemical engineering was housed in Baker Laboratory. In 1942, Olin Hall was completed and we moved into our new quarters. This new building has made it possible to accommodate our greatly increased enrollment and to increase the effectiveness of our instruction.

Staff

When the work in chemical engineering was started at Cornell the staff consisted of Professor Rhodes and two graduate assistants. The growth of the student body and the increase in the scope and content of the courses has made it necessary for us to add to the staff of instruction from time to time. Professor Mason, who was originally a member of the staff in Chemistry, transferred to the School of Chemical Engineering when the new school was first organized. Professor Winding came to us as Instructor in Chemical Engineering in 1935. Professor Swenson was with us from September 1938 to June 1946. This year we have added four new men to our staff: Professor Kyle and Assistant Professor Burton, both in the field of metallurgy, and Assistant Professors Smith and Von Berg in Chemical Engineering.

Machinery for experimental filtration in the three-story Unit Operations Lab.

In the short period of its separate existence, the School of Chemical Engineering at Cornell has come to occupy an outstanding position in chemical engineering education in America. We have every reason to expect that in the years to come we shall maintain and strengthen that position.

RCA Victor "Eye Witness" television receiver shown above, gives you 52 square inches of picture brilliance.

A referee's eye view of every play—by Television!

You feel as though you were right there at the game—when you see it through RCA's brilliant television.

Football fans as far as 250 miles away from the stadium have enjoyed watching many of the big games this fall through NBC telecasts. And football fans become television fans when they see how closely the camera follows the ball.

At the game, the sensitive RCA Image Orthicon television camera sees every line plunge, kick, pass and run. It may be a cloudy day or the sun may go down but you still enjoy the *bright sharpness* of the RCA Image Orthicon camera.

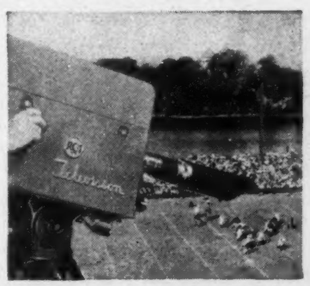
On the screen of your RCA Victor home television receiver none of that bright sharpness is lost.

For after you've tuned in the game, the new RCA Victor "Eye Witness" Picture Synchronizer automatically "locks" the picture in tune with the sending station—eliminates any distortion—assures you of *clearer, steadier* pictures.

For television at its best, as pioneered at RCA Laboratories, you'll want the receiver that features the most famous name in television today—RCA Victor.

• • •

Radio Corporation of America, RCA Building, Radio City, New York 20, N. Y.



RCA Image Orthicon television camera—developed at RCA Laboratories—makes close-ups out of long shots. It enables television to go anywhere by freeing it from the need for strong lights or sunshine.

RCA **RADIO CORPORATION of AMERICA**

STRESS and STRAIN...

"I have a friend I'd like you girls to meet."

Athletic Girl: "What can he do?"

Chorus Girl: "How much has he?"

Literary Girl: "What does he read?"

Religious Girl: "What church does he attend?"

Sorority Girl: "Where is he?"

* * *

The lady of the house was entertaining her bridge club when the pattering of tiny feet was heard on the stairs. She raised her hand for silence.

"Hush," she said softly, "the children are going to deliver their goodnight message. It always gives me such a feeling of reverence to hear them—listen!"

There was a moment of silence—then shyly, "Mama, Willie found a bedbug."

* * *

Clerk: "Here's a pretty card with a lovely sentiment: 'To the only girl I ever loved'."

Waldbieser: "That's fine. Give me a dozen."

* * *

Warden: What made you beat up your cell-mate the way you did?"

Convict: "Aw, dat guy gits wise wit me."

Warden: "What's he done now?"

Convict: "Tore da leaf off the calendar and it was my toin."

* * *

A Red Cross worker on a remote Pacific island called up the Army command and said, "We have a case of beri-beri here. What shall we do with it?"

"Oh, give it to the Seabees. They'll drink anything."

* * *

The stork is one of the mystics,
And inhabits a number of districts.
It doesn't yield plumes
Or sing pretty tunes,
But helps out with vital statistics.

Curious fly,
Vinegar jug,
Slippery edge,
Pickled bug.

* * *

When a fellow breaks a date,
He usually has to,
When a girl breaks a date,
She usually has two.

* * *

"Are you a college man?"

"No, a horse stepped on my hat."

* * *

Mess Sergeant: "You're not eating your fish. What's wrong with it?"

Buck Private: "Long time no sea."

* * *

They say that the sun in California is so invigorating that the caretakers in the graveyards go around saying: "Lie down, lie down."

* * *

"Say, I hear you lost your job. Why did the foreman fire you?

"Well, you know what a foreman is—he's the one who stands around and watches his men work."

"What's that got to do with it?"

"Why, he got jealous of me. People thought I was the foreman."

* * *

In the parlor there were three—
The girl, the lamp, and he.
Two is company, no doubt
That is why the lamp went out.

* * *

P.O.: "Chief, there's an applicant here who said he used to make his living by sticking his right arm into a lion's mouth."

C.P.O.: "What's his name?"

P.O.: "Lefty."

* * *

Pete: "So your wife came to you on her knees last night?"

Dave: "Yes, and dared me to come out from under the bed."

* * *

"Your leg is swollen," admitted the doctor, "but I wouldn't worry about it."

"Well, if your leg was swollen, I wouldn't worry about it either."

. . . Gauze . . . Scalpel . . . Sponge

Barber: "Was your tie red when you came in?"

Customer: "No, it wasn't."

Barber: "Gosh!"

* * *

"Johnny ——Johnny!"

"Huh, ma?"

"Are you spitting in the fish bowl?"

"No, but I've been coming pretty close."

* * *

"I guess I'll cut in on this dance," said the surgeon as he chloroformed the St. Vitus patient.

* * *

The man who gives in when he is wrong is wise, and the one who gives in when he is right is married.

* * *

"I just bought a skunk."

"Where ya gonna keep him?"

"Under the bed."

"What about the awful smell?"

"He'll have to get used to it like I did."

* * *

A Scotch farmer back from the country fair with a new horse found the animal refused to eat or drink. The farmer's eyes gleamed hopefully: "By golly, I've got a real bargain if he's a good worker."

onge

when

fish

retty

ace,"
oro-

ne is
who
ried.

ell?"
like

the
und
ink.
ope-
real

ER